

# Package ‘waterquality’

October 21, 2020

**Title** Satellite Derived Water Quality Detection Algorithms

**Version** 0.2.6

**Description** The main purpose of waterquality is to quickly and easily convert satellite-based reflectance imagery into one or many well-known water quality algorithms designed for the detection of harmful algal blooms or the following pigment proxies: chlorophyll-a, blue-green algae (phycocyanin), and turbidity. Johansen et al. (2019) <doi:10.21079/11681/35053>.

**Depends** R (>= 3.4.0)

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**Imports** methods, raster, rgdal, purrr, caret, vctrs, magrittr, dplyr,  
pingr

**RoxygenNote** 7.1.1

**Suggests** testthat, knitr, tibble, rmarkdown, covr, tmap, tmaptools,  
OpenStreetMap, sf

**URL** <https://github.com/RAJohansen/waterquality>

**BugReports** <https://github.com/RAJohansen/waterquality/issues>

**VignetteBuilder** knitr

**NeedsCompilation** no

**Author** Richard Johansen [aut, cre] (<<https://orcid.org/0000-0003-4287-9677>>),  
Jakub Nowosad [aut] (<<https://orcid.org/0000-0002-1057-3721>>),  
Molly Reif [aut] (<<https://orcid.org/0000-0003-4207-1459>>),  
Erich Emery [aut],  
U.S. Army Corps of Engineers [fnd]

**Maintainer** Richard Johansen <[richard.a.johansen@erdc.dren.mil](mailto:richard.a.johansen@erdc.dren.mil)>

**Repository** CRAN

**Date/Publication** 2020-10-21 18:50:02 UTC

**R topics documented:**

Al10SABI . . . . .	3
Am092Bsub . . . . .	4
Am09KBBI . . . . .	5
Be162B643sub629 . . . . .	6
Be162B700sub601 . . . . .	7
Be162BsubPhy . . . . .	8
Be16FLHblue . . . . .	9
Be16FLHBlueRedNIR . . . . .	10
Be16FLHGreenRedNIR . . . . .	11
Be16FLHviolet . . . . .	12
Be16FLHVioletRedNIR . . . . .	13
Be16MPI . . . . .	14
Be16NDPhyI . . . . .	15
Be16NDPhyI644over615 . . . . .	16
Be16NDPhyI644over629 . . . . .	17
Be16NDTIblue . . . . .	18
Be16NDTIviolet . . . . .	19
Be16Phy2BDA644over629 . . . . .	20
Da052BDA . . . . .	21
De933BDA . . . . .	22
extract_lm . . . . .	23
extract_lm_cv . . . . .	23
extract_lm_cv_all . . . . .	25
extract_lm_cv_multi . . . . .	26
Gi033BDA . . . . .	27
Go04MCI . . . . .	28
HU103BDA . . . . .	29
Kn07KIVU . . . . .	30
Ku15PhyCI . . . . .	31
Ku15SLH . . . . .	32
Map_WQ_basemap . . . . .	33
Map_WQ_raster . . . . .	34
MI092BDA . . . . .	35
MM092BDA . . . . .	36
MM12NDCI . . . . .	37
MM12NDCIalt . . . . .	38
MM143BDAopt . . . . .	39
SI052BDA . . . . .	40
SM122BDA . . . . .	41
SY002BDA . . . . .	42
TurbBe16GreenPlusRedBothOverViolet . . . . .	43
TurbBe16RedOverViolet . . . . .	44
TurbBow06RedOverGreen . . . . .	45
TurbChip09NIROverGreen . . . . .	45
TurbDox02NIROverRed . . . . .	46
TurbFrohn09GreenPlusRedBothOverBlue . . . . .	47

TurbHarr92NIR . . . . . 48  
 TurbLath91RedOverBlue . . . . . 49  
 TurbMoore80Red . . . . . 50  
 wq\_algorithms . . . . . 50  
 wq\_calc . . . . . 51  
 Wy08CI . . . . . 52  
 Zh10FLH . . . . . 53

**Index** **54**

All0SABI *All0SABI algorithm*

**Description**

Applies the All0SABI algorithm

**Usage**

All0SABI(w857, w644, w458, w529)

**Arguments**

w857            numeric. Value at wavelength of 857 nm  
 w644            numeric. Value at wavelength of 644 nm  
 w458            numeric. Value at wavelength of 458 nm  
 w529            numeric. Value at wavelength of 529 nm

**Value**

RasterLayer or numeric

**References**

Alawadi, F. Detection of surface algal blooms using the newly developed algorithm surface algal bloom index (SABI). Proc. SPIE 2010, 7825.

**See Also**

Other algorithms: [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

Am092Bsub

*Am092Bsub algorithm***Description**

Applies the Am092Bsub algorithm

**Usage**

```
Am092Bsub(w681, w665)
```

**Arguments**

w681	numeric. Value at wavelength of 681 nm
w665	numeric. Value at wavelength of 665 nm

**Value**

RasterLayer or numeric

**References**

Amin, R.; Zhou, J.; Gilerson, A.; Gross, B.; Moshary, F.; Ahmed, S. Novel optical techniques for detecting and classifying toxic dinoflagellate *Karenia brevis* blooms using satellite imagery. *Opt. Express* 2009, 17, 9126–9144.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Am09KBBI	<i>Am09KBBI algorithm</i>
----------	---------------------------

---

### Description

Applies the Am09KBBI algorithm

### Usage

Am09KBBI(w686, w658)

### Arguments

w686	numeric. Value at wavelength of 686 nm
w658	numeric. Value at wavelength of 658 nm

### Value

RasterLayer or numeric

### References

Amin, R.; Zhou, J.; Gilerson, A.; Gross, B.; Moshary, F.; Ahmed, S.; Novel optical techniques for detecting and classifying toxic dinoflagellate *Karenia brevis* blooms using satellite imagery, *Optics Express*, 2009, 17, 11, 1-13.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be162B643sub629

*Be162B643sub629 algorithm*


---

### Description

Applies the Be162B643sub629 algorithm

### Usage

Be162B643sub629(w644, w629)

### Arguments

w644	numeric. Value at wavelength of 644 nm
w629	numeric. Value at wavelength of 729 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHViolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be162B700sub601

*Be162B700sub601 algorithm*


---

**Description**

Applies the Be162B700sub601 algorithm

**Usage**

Be162B700sub601(w700, w601)

**Arguments**

w700	numeric. Value at wavelength of 700 nm
w601	numeric. Value at wavelength of 601 nm

**Value**

RasterLayer or numeric

**References**

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHViolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [Turblath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be162BsubPhy

*Be162BsubPhy algorithm*


---

### Description

Applies the Be162BsubPhy algorithm

### Usage

Be162BsubPhy(w715, w615)

### Arguments

w715	numeric. Value at wavelength of 715 nm
w615	numeric. Value at wavelength of 615 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)



---

Be16FLHblue	<i>Be16FLHblue algorithm</i>
-------------	------------------------------

---

### Description

Applies the Be16FLHblue algorithm

### Usage

Be16FLHblue(w529, w644, w458)

### Arguments

w529	numeric. Value at wavelength of 529 nm
w644	numeric. Value at wavelength of 644 nm
w458	numeric. Value at wavelength of 458 nm

### Value

RasterLayer or numeric

### References

Beck, R.A. and 22 others; Comparison of satellite reflectance algorithms for estimating chlorophyll-a in a temperate reservoir using coincident hyperspectral aircraft imagery and dense coincident surface observations, *Remote Sens. Environ.*, 2016, 178, 15-30.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16FLHBlueRedNIR      *Be16FLHBlueRedNIR algorithm*

---

### Description

Applies the Be16FLHBlueRedNIR algorithm

### Usage

Be16FLHBlueRedNIR(w658, w857, w458)

### Arguments

w658	numeric. Value at wavelength of 658 nm
w857	numeric. Value at wavelength of 857 nm
w458	numeric. Value at wavelength of 458 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTblue\(\)](#), [Be16NDTiviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIR0verGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16FLHGreenRedNIR      *Be16FLHGreenRedNIR algorithm*

---

### Description

Applies the Be16FLHGreenRedNIR algorithm

### Usage

Be16FLHGreenRedNIR(w658, w857, w558)

### Arguments

w658	numeric. Value at wavelength of 658 nm
w857	numeric. Value at wavelength of 857 nm
w558	numeric. Value at wavelength of 558 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHViolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIViolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIR0verGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16FLHviolet	<i>Be16FLHviolet algorithm</i>
---------------	--------------------------------

---

### Description

Applies the Be16FLHviolet algorithm

### Usage

Be16FLHviolet(w529, w644, w429)

### Arguments

w529	numeric. Value at wavelength of 529 nm
w644	numeric. Value at wavelength of 644 nm
w429	numeric. Value at wavelength of 429 nm

### Value

RasterLayer or numeric

### References

Beck, R.A. and 22 others; Comparison of satellite reflectance algorithms for estimating chlorophyll-a in a temperate reservoir using coincident hyperspectral aircraft imagery and dense coincident surface observations, *Remote Sens. Environ.*, 2016, 178, 15-30.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIViolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16FLHVioletRedNIR     *Be16FLHVioletRedNIR algorithm*

---

### Description

Applies the Be16FLHVioletRedNIR algorithm

### Usage

Be16FLHVioletRedNIR(w658, w857, w444)

### Arguments

w658	numeric. Value at wavelength of 658 nm
w857	numeric. Value at wavelength of 857 nm
w444	numeric. Value at wavelength of 444 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIViolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIR0verGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be16MPI

*Be16MPI algorithm*


---

**Description**

Applies the Be16MPI algorithm

**Usage**

Be16MPI(w615, w601, w644)

**Arguments**

w615	numeric. Value at wavelength of 615 nm
w601	numeric. Value at wavelength of 601 nm
w644	numeric. Value at wavelength of 644 nm

**Value**

RasterLayer or numeric

**References**

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIR0verGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be16NDPhyI

*Be16NDPhyI algorithm*


---

**Description**

Applies the Be16NDPhyI algorithm

**Usage**

Be16NDPhyI(w700, w622)

**Arguments**

w700	numeric. Value at wavelength of 700 nm
w622	numeric. Value at wavelength of 622 nm

**Value**

RasterLayer or numeric

**References**

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16NDPhyI644over615 *Be16NDPhyI644over615 algorithm*

---

### Description

Applies the Be16NDPhyI644over615 algorithm

### Usage

Be16NDPhyI644over615(w644, w615)

### Arguments

w644	numeric. Value at wavelength of 644 nm
w615	numeric. Value at wavelength of 615 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)



---

Be16NDPhyI644over629 *Be16NDPhyI644over629 algorithm*

---

### Description

Applies the Be16NDPhyI644over629 algorithm

### Usage

Be16NDPhyI644over629(w644, w629)

### Arguments

w644	numeric. Value at wavelength of 644 nm
w629	numeric. Value at wavelength of 629 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Be16NDTlblue

*Be16NDTlblue algorithm*


---

### Description

Applies the Be16NDTlblue algorithm

### Usage

Be16NDTlblue(w658, w458)

### Arguments

w658	numeric. Value at wavelength of 658 nm
w458	numeric. Value at wavelength of 458 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTlviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16NDTIviolet	<i>Be16NDTIviolet algorithm</i>
----------------	---------------------------------

---

### Description

Applies the Be16NDTIviolet algorithm

### Usage

```
Be16NDTIviolet(w658, w444)
```

### Arguments

w658	numeric. Value at wavelength of 658 nm
w444	numeric. Value at wavelength of 444 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [Turblath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Be16Phy2BDA644over629 *Be16Phy2BDA644over629 algorithm*

---

### Description

Applies the Be16Phy2BDA644over629 algorithm

### Usage

Be16Phy2BDA644over629(w644, w629)

### Arguments

w644	numeric. Value at wavelength of 644 nm
w629	numeric. Value at wavelength of 629 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [Turblath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Da052BDA	<i>Da052BDA algorithm</i>
----------	---------------------------

---

### Description

Applies the Da052BDA algorithm

### Usage

Da052BDA(w714, w672)

### Arguments

w714	numeric. Value at wavelength of 714 nm
w672	numeric. Value at wavelength of 672 nm

### Value

RasterLayer or numeric

### References

Wynne, T. T., Stumpf, R. P., Tomlinson, M. C., Warner, R. A., Tester, P. A., Dyble, J.; Relating spectral shape to cyanobacterial blooms in the Laurentian Great Lakes. *Int. J. Remote Sens.*, 2008, 29, 3665–3672.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 De933BDA

*De933BDA algorithm*


---

### Description

Applies the De933BDA algorithm

### Usage

De933BDA(w600, w648, w625)

### Arguments

w600	numeric. Value at wavelength of 600 nm
w648	numeric. Value at wavelength of 648 nm
w625	numeric. Value at wavelength of 625 nm

### Value

RasterLayer or numeric

### References

Dekker, A.; Detection of the optical water quality parameters for eutrophic waters by high resolution remote sensing, Ph.D. thesis, 1993, Free University, Amsterdam.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

extract_lm	<i>Run linear model (lm)</i>
------------	------------------------------

---

**Description**

The function runs a linear model on a single water quality parameter and a water quality algorithm and returns a data frame containing the following:  $r^2$ , p-value, slope, and intercept of the model

**Usage**

```
extract_lm(parameter, algorithm, df)
```

**Arguments**

parameter	A string specifying water quality parameter
algorithm	A string specifying water quality algorithm
df	data frame containing the values for parameter and algorithm arguments

**Value**

A data frame of the model results

**References**

Johansen, Richard; et al. (2018). Evaluating the portability of satellite derived chlorophyll-a algorithms for temperate inland lakes using airborne hyperspectral imagery and dense surface observations. *Harmful Algae*. 76. 10.1016/j.hal.2018.05.001.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

**See Also**

Other extract\_lm: [extract\\_lm\\_cv\\_all\(\)](#), [extract\\_lm\\_cv\\_multi\(\)](#), [extract\\_lm\\_cv\(\)](#)

---

extract_lm_cv	<i>Run linear model with crossvalidation</i>
---------------	--

---

**Description**

The function runs a linear model on a single water quality parameter and a water quality algorithm and conducts a k-folds cross validation, which returns a data frame containing the following: The  $r^2$ , p-value, slope, intercept of the global lm model & average  $r^2$ , average RMSE, average MAE from the crossvalidated model

**Usage**

```
extract_lm_cv(
  parameter,
  algorithm,
  df,
  train_method = "lm",
  control_method = "repeatedcv",
  folds = 3,
  nrepeats = 5
)
```

**Arguments**

parameter	water quality parameter
algorithm	water quality algorithm
df	data frame containing the values for parameter and algorithm arguments
train_method	A string specifying which classification or regression model to use (Default = "lm"). See ?caret::train for more details
control_method	A string specifying the resampling method (Default = "repeatedcv"). See ?caret::trainControl for more details
folds	the number of folds to be used in the cross validation model
nrepeats	the number of iterations to be used in the cross validation model

**Value**

A data frame of the model results

**References**

Johansen, Richard; et al. (2018). Evaluating the portability of satellite derived chlorophyll-a algorithms for temperate inland lakes using airborne hyperspectral imagery and dense surface observations. *Harmful Algae*. 76. 10.1016/j.hal.2018.05.001.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

Max Kuhn. Contributions from Jed Wing, Steve Weston, Andre Williams, Chris Keefer, Allan Engelhardt, Tony Cooper, Zachary Mayer, Brenton Kenkel, the R Core Team, Michael Benesty, Reynald Lescarbeau, Andrew Ziem, Luca Scrucca, Yuan Tang, Can Candan and Tyler Hunt. (2018). caret: Classification and Regression Training. R package version 6.0-81. <https://CRAN.R-project.org/package=caret>

**See Also**

Other extract\_lm: [extract\\_lm\\_cv\\_all\(\)](#), [extract\\_lm\\_cv\\_multi\(\)](#), [extract\\_lm\(\)](#)



---

extract_lm_cv_all	<i>Run linear model with crossvalidation over multiple dependent and all numeric independent variables in a data frame</i>
-------------------	--

---

### Description

The function runs a linear model on a list of x and list of y variables and conducts a k-folds cross validation, which returns a data frame containing the following: The  $r^2$ , p-value, slope, intercept of the global lm model & average  $r^2$ , average RMSE, average MAE from the crossvalidated model

### Usage

```
extract_lm_cv_all(
  parameters,
  df,
  train_method = "lm",
  control_method = "repeatedcv",
  folds = 3,
  nrepeats = 5
)
```

### Arguments

parameters	the list of dependent variables to be evaluated
df	data frame containing the values for parameter and algorithm arguments
train_method	A string specifying which classification or regression model to use (Default = "lm"). See <code>?caret::train</code> for more details
control_method	A string specifying the resampling method (Default = "repeatedcv"). See <code>?caret::trainControl</code> for more details
folds	the number of folds to be used in the cross validation model
nrepeats	the number of iterations to be used in the cross validation model

### Value

A data frame of the model results

### References

Johansen, Richard; et al. (2018). Evaluating the portability of satellite derived chlorophyll-a algorithms for temperate inland lakes using airborne hyperspectral imagery and dense surface observations. *Harmful Algae*. 76. 10.1016/j.hal.2018.05.001.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

Max Kuhn. Contributions from Jed Wing, Steve Weston, Andre Williams, Chris Keefer, Allan Engelhardt, Tony Cooper, Zachary Mayer, Brenton Kenkel, the R Core Team, Michael Benesty, Reynald Lescarbeau, Andrew Ziem, Luca Scrucca, Yuan Tang, Can Candan and Tyler Hunt.

(2018). caret: Classification and Regression Training. R package version 6.0-81. <https://CRAN.R-project.org/package=caret>

### See Also

Other extract\_lm: [extract\\_lm\\_cv\\_multi\(\)](#), [extract\\_lm\\_cv\(\)](#), [extract\\_lm\(\)](#)

---

extract_lm_cv_multi	<i>Run linear model with crossvalidation over multiple independent and dependent variables</i>
---------------------	--

---

### Description

The function runs a linear model on a list of x and list of y variables and conducts a k-folds cross validation, which returns a data frame containing the following: The  $r^2$ , p-value, slope, intercept of the global lm model & average  $r^2$ , average RMSE, average MAE from the crossvalidated model

### Usage

```
extract_lm_cv_multi(
  parameters,
  algorithms,
  df,
  train_method = "lm",
  control_method = "repeatedcv",
  folds = 3,
  nrepeats = 5
)
```

### Arguments

parameters	the list of a water quality parameters to be evaluated
algorithms	the list of water quality algorithms to be evaluated
df	data frame containing the values for parameters and algorithms arguments
train_method	A string specifying which classification or regression model to use (Default = "lm"). See ?caret::train for more details
control_method	A string specifying the resampling method (Default = "repeatedcv"). See ?caret::trainControl for more details
folds	the number of folds to be used in the cross validation model
nrepeats	the number of iterations to be used in the cross validation model

### Value

A data frame of the model results

## References

Johansen, Richard; et al. (2018). Evaluating the portability of satellite derived chlorophyll-a algorithms for temperate inland lakes using airborne hyperspectral imagery and dense surface observations. *Harmful Algae*. 76. 10.1016/j.hal.2018.05.001.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

Max Kuhn. Contributions from Jed Wing, Steve Weston, Andre Williams, Chris Keefer, Allan Engelhardt, Tony Cooper, Zachary Mayer, Brenton Kenkel, the R Core Team, Michael Benesty, Reynald Lescarbeau, Andrew Ziem, Luca Scrucca, Yuan Tang, Can Candan and Tyler Hunt. (2018). caret: Classification and Regression Training. R package version 6.0-81. <https://CRAN.R-project.org/package=caret>

## See Also

Other `extract_lm`: [extract\\_lm\\_cv\\_all\(\)](#), [extract\\_lm\\_cv\(\)](#), [extract\\_lm\(\)](#)

---

Gi033BDA

*Gi033BDA algorithm*

---

## Description

Applies the Gi033BDA algorithm

## Usage

```
Gi033BDA(w672, w715, w757)
```

## Arguments

w672	numeric. Value at wavelength of 672 nm
w715	numeric. Value at wavelength of 715 nm
w757	numeric. Value at wavelength of 757 nm

## Value

RasterLayer or numeric

## References

Gitelson, A.A.; U. Gritz, and M. N. Merzlyak.; Relationships between leaf chlorophyll content and spectral reflectance and algorithms for non-destructive chlorophyll assessment in higher plant leaves. *J. Plant Phys.* 2003, 160, 271-282.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

Go04MCI

*Go04MCI algorithm***Description**

Applies the Go04MCI algorithm

**Usage**

Go04MCI(w709, w681, w753)

**Arguments**

w709	numeric. Value at wavelength of 709 nm
w681	numeric. Value at wavelength of 681 nm
w753	numeric. Value at wavelength of 753 nm

**Value**

RasterLayer or numeric

**References**

Gower, J.F.R.; Brown, L.; Borstad, G.A.; Observation of chlorophyll fluorescence in west coast waters of Canada using the MODIS satellite sensor. *Can. J. Remote Sens.*, 2004, 30 (1), 17–25.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 HU103BDA

*HU103BDA algorithm*


---

### Description

Applies the HU103BDA algorithm

### Usage

HU103BDA(w615, w600, w725)

### Arguments

w615	numeric. Value at wavelength of 615 nm
w600	numeric. Value at wavelength of 600 nm
w725	numeric. Value at wavelength of 725 nm

### Value

RasterLayer or numeric

### References

Hunter, P.D.; Tyler, A.N.; Willby, N.J.; Gilvear, D.J.; The spatial dynamics of vertical migration by *Microcystis aeruginosa* in a eutrophic shallow lake: A case study using high spatial resolution time-series airborne remote sensing. *Limn. Oceanogr.* 2008, 53, 2391-2406.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Kn07KIVU

*Kn07KIVU algorithm*


---

**Description**

Applies the Kn07KIVU algorithm

**Usage**

Kn07KIVU(w458, w644, w529)

**Arguments**

w458	numeric. Value at wavelength of 458 nm
w644	numeric. Value at wavelength of 644 nm
w529	numeric. Value at wavelength of 529 nm

**Value**

RasterLayer or numeric

**References**

Kneubuhler, M.; Frank T.; Kellenberger, T.W; Pasche N.; Schmid M.; Mapping chlorophyll-a in Lake Kivu with remote sensing methods. 2007, Proceedings of the Envisat Symposium 2007, Montreux, Switzerland 23–27 April 2007 (ESA SP-636, July 2007).

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

Ku15PhyCI	<i>Ku15PhyCI algorithm</i>
-----------	----------------------------

---

**Description**

Applies the Ku15PhyCI algorithm

**Usage**

Ku15PhyCI(w681, w665, w709)

**Arguments**

w681	numeric. Value at wavelength of 681 nm
w665	numeric. Value at wavelength of 665 nm
w709	numeric. Value at wavelength of 709 nm

**Value**

RasterLayer or numeric

**References**

Kudela, R.M., Palacios, S.L., Austerberry, D.C., Accorsi, E.K., Guild, L.S.; Application of hyper-spectral remote sensing to cyanobacterial blooms in inland waters, Torres-Perez, J., 2015, Remote Sens. Environ., 2015, 167, 1-10.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 Ku15SLH

*Ku15SLH algorithm*


---

### Description

Applies the Ku15SLH algorithm

### Usage

Ku15SLH(w715, w658)

### Arguments

w715	numeric. Value at wavelength of 715 nm
w658	numeric. Value at wavelength of 658 nm

### Value

RasterLayer or numeric

### References

Kudela, R.M., Palacios, S.L., Austerberry, D.C., Accorsi, E.K., Guild, L.S.; Application of hyper-spectral remote sensing to cyanobacterial blooms in inland waters, Torres-Perez, J., 2015, Remote Sens. Environ., 2015, 167, 1-10.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIViolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)



---

Map_WQ_basemap	<i>Create waterquality Map with Bing basemap</i>
----------------	--

---

### Description

This function wraps the tmap package to help users generate fast and simple data visualization of using bing basemaps along with optional geospatial objects and histogram

### Usage

```
Map_WQ_basemap(  
  WQ_extent,  
  sample_points,  
  map_title,  
  WQ_parameter,  
  points_style = "quantile",  
  histogram = TRUE  
)
```

### Arguments

WQ_extent	geospatial file (vector or raster) used to extract aerial imagery from Bing basemaps
sample_points	geospatial file (.shp or .gpkg) containing sampling locations
map_title	text used to generate title of map
WQ_parameter	text referring to column heading of data being mapped (i.e. Chl-a, PC, etc.)
points_style	method to process the color scale when col is a numeric variable. Please refer to the style argument in the ?tmap::tm_raster() function for more details (Default is "quantile").
histogram	Option to add or remove a histogram of the data values. (Default is TRUE)

### Value

A data visualization of the results

### See Also

Other Map\_WQ models: [Map\\_WQ\\_raster\(\)](#)

---

Map_WQ_raster	<i>Create waterquality Map with sampling points and optional histogram</i>
---------------	--

---

### Description

This function wraps the tmap package to help users generate fast and simple data visualization of their WQ\_calc raster output along with optional geospatial objects and histogram

### Usage

```
Map_WQ_raster(  
  WQ_raster,  
  sample_points,  
  map_title,  
  raster_style = "quantile",  
  histogram = TRUE  
)
```

### Arguments

WQ_raster	Raster file generated from wq_calc or other GeoTiff file
sample_points	geospatial file (.shp or .gpkg) containing sampling locations
map_title	text used to generate title of map
raster_style	method to process the color scale when col is a numeric variable. Please refer to the style argument in the ?tmap::tm_raster() function for more details (Default is "quantile").
histogram	Option to add or remove a histogram of the data values. (Default is TRUE)

### Value

A data visualization of the results

### See Also

Other Map\_WQ models: [Map\\_WQ\\_baseemap\(\)](#)

---

MI092BDA	<i>MI092BDA algorithm</i>
----------	---------------------------

---

### Description

Applies the MI092BDA algorithm

### Usage

MI092BDA(w700, w600)

### Arguments

w700	numeric. Value at wavelength of 700 nm
w600	numeric. Value at wavelength of 600 nm

### Value

RasterLayer or numeric

### References

Mishra, S.; Mishra, D.R.; Schlachter, W. M., A novel algorithm for predicting PC concentrations in cyanobacteria: A proximal hyperspectral remote sensing approach. *Remote Sens.*, 2009, 1, 758–775.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

MM092BDA

*MM092BDA algorithm***Description**

Applies the MM092BDA algorithm

**Usage**

```
MM092BDA(w724, w600)
```

**Arguments**

w724	numeric. Value at wavelength of 724 nm
w600	numeric. Value at wavelength of 600 nm

**Value**

RasterLayer or numeric

**References**

Mishra, S.; Mishra, D.R.; Schlachter, W. M., A novel algorithm for predicting PC concentrations in cyanobacteria: A proximal hyperspectral remote sensing approach. *Remote Sens.*, 2009, 1, 758–775.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

MM12NDCI	<i>MM12NDCI algorithm</i>
----------	---------------------------

---

### Description

Applies the MM12NDCI algorithm

### Usage

MM12NDCI(w715, w686)

### Arguments

w715	numeric. Value at wavelength of 714 nm
w686	numeric. Value at wavelength of 686 nm

### Value

RasterLayer or numeric

### References

Mishra, S.; and Mishra, D.R. Normalized difference chlorophyll index: A novel model for remote estimation of chlorophyll-a concentration in turbid productive waters, *Remote Sens. Environ.*, 2012, 117, 394-406.

### See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

MM12NDCIalt

*MM12NDCIalt algorithm***Description**

Applies the MM12NDCIalt algorithm

**Usage**

```
MM12NDCIalt(w700, w658)
```

**Arguments**

w700	numeric. Value at wavelength of 700 nm
w658	numeric. Value at wavelength of 658 nm

**Value**

RasterLayer or numeric

**References**

Mishra, S.; Mishra, D.R.; A novel remote sensing algorithm to quantify phycocyanin in cyanobacterial algal blooms, *Env. Res. Lett.*, 2014, 9 (11), DOI:10.1088/1748-9326/9/11/114003

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

MM143BDAopt	<i>MM143BDAopt algorithm</i>
-------------	------------------------------

---

### Description

Applies the MM143BDAopt algorithm

### Usage

MM143BDAopt(w629, w659, w724)

### Arguments

w629	numeric. Value at wavelength of 629 nm
w659	numeric. Value at wavelength of 659 nm
w724	numeric. Value at wavelength of 724 nm

### Value

RasterLayer or numeric

### References

Mishra, S.; Mishra, D.R.; A novel remote sensing algorithm to quantify phycocyanin in cyanobacterial algal blooms, *Env. Res. Lett.*, 2014, 9 (11), DOI:10.1088/1748-9326/9/11/114003

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

SI052BDA

*SI052BDA algorithm***Description**

Applies the SI052BDA algorithm

**Usage**

SI052BDA(w709, w620)

**Arguments**

w709                numeric. Value at wavelength of 709 nm

w620                numeric. Value at wavelength of 620 nm

**Value**

RasterLayer or numeric

**References**

Simis, S. G. H.; Peters, S.W. M.; Gons, H. J.; Remote sensing of the cyanobacteria pigment phycocyanin in turbid inland water. *Limn. Oceanogr.*, 2005, 50, 237–245.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)



---

SM122BDA	<i>SM122BDA algorithm</i>
----------	---------------------------

---

### Description

Applies the SM122BDA algorithm

### Usage

SM122BDA(w709, w600)

### Arguments

w709	numeric. Value at wavelength of 709 nm
w600	numeric. Value at wavelength of 600 nm

### Value

RasterLayer or numeric

### References

Mishra, S. Remote sensing of cyanobacteria in turbid productive waters, PhD Dissertation. Mississippi State University, USA. 2012.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

SY002BDA

*SY002BDA algorithm***Description**

Applies the SY002BDA algorithm

**Usage**

SY002BDA(w650, w625)

**Arguments**

w650	numeric. Value at wavelength of 650 nm
w625	numeric. Value at wavelength of 625 nm

**Value**

RasterLayer or numeric

**References**

Schalles, J.; Yacobi, Y. Remote detection and seasonal patterns of phycocyanin, carotenoid and chlorophyll-a pigments in eutrophic waters. Archiv fur Hydrobiologie, Special Issues Advances in Limnology, 2000, 55,153–168.

**See Also**

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHViolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

 TurbBe16GreenPlusRedBothOverViolet

*TurbBe16GreenPlusRedBothOverViolet algorithm*


---

### Description

Applies the TurbBe16GreenPlusRedBothOverViolet algorithm

### Usage

TurbBe16GreenPlusRedBothOverViolet(w558, w658, w444)

### Arguments

w558	numeric. Value at wavelength of 558 nm
w658	numeric. Value at wavelength of 658 nm
w444	numeric. Value at wavelength of 444 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverViolet\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbBe16RedOverViolet *TurbBe16RedOverViolet algorithm*

---

### Description

Applies the TurbBe16RedOverViolet algorithm

### Usage

TurbBe16RedOverViolet(w658, w444)

### Arguments

w658	numeric. Value at wavelength of 658 nm
w444	numeric. Value at wavelength of 444 nm

### Value

RasterLayer or numeric

### References

Beck, R.; Xu, M.; Zhan, S.; Liu, H.; Johansen, R.A.; Tong, S.; Yang, B.; Shu, S.; Wu, Q.; Wang, S.; Berling, K.; Murray, A.; Emery, E.; Reif, M.; Harwood, J.; Young, J.; Martin, M.; Stillings, G.; Stumpf, R.; Su, H.; Ye, Z.; Huang, Y. Comparison of Satellite Reflectance Algorithms for Estimating Phycocyanin Values and Cyanobacterial Total Biovolume in a Temperate Reservoir Using Coincident Hyperspectral Aircraft Imagery and Dense Coincident Surface Observations. *Remote Sens.* 2017, 9, 538.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHViolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIViolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverTurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverTurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbBow06RedOverGreen *TurbBow06RedOverGreen algorithm*

---

**Description**

Applies the TurbBow06RedOverGreen algorithm

**Usage**

TurbBow06RedOverGreen(w658, w558)

**Arguments**

w658	numeric. Value at wavelength of 658 nm
w558	numeric. Value at wavelength of 558 nm

**Value**

RasterLayer or numeric

**References**

Bowers, D. G., and C. E. Binding. 2006. "The Optical Properties of Mineral Suspended Particles: A Review and Synthesis." *Estuarine Coastal and Shelf Science* 67 (1–2): 219–230. doi:10.1016/j.ecss.2005.11.010.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOver](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbChip09NIROverGreen

*TurbChip09NIROverGreen algorithm*

---

**Description**

Applies the TurbChip09NIROverGreen algorithm

**Usage**

TurbChip09NIROverGreen(w857, w558)

**Arguments**

w857	numeric. Value at wavelength of 857 nm
w558	numeric. Value at wavelength of 558 nm

**Value**

RasterLayer or numeric

**References**

Chipman, J. W.; Olmanson, L.G.; Gitelson, A.A.; Remote sensing methods for lake management: A guide for resource managers and decision-makers. 2009, Developed by the North American Lake Management Society in collaboration with Dartmouth College, University of Minnesota, and University of Nebraska for the United States Environmental Protection Agency.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOver](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbDox02NIRoverRed     *TurbDox02NIRoverRed algorithm*

---

**Description**

Applies the TurbDox02NIRoverRed algorithm

**Usage**

TurbDox02NIRoverRed(w857, w658)

**Arguments**

w857	numeric. Value at wavelength of 857 nm
w658	numeric. Value at wavelength of 658 nm

**Value**

RasterLayer or numeric

**References**

Doxaran, D., Froidefond, J.-M.; Castaing, P. ; A reflectance band ratio used to estimate suspended matter concentrations in sediment-dominated coastal waters, *Remote Sens.*, 2002, 23, 5079-5085.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverBlue\(\)](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIR0verGreen\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbFrohn09GreenPlusRedBothOverBlue

*TurbFrohn09GreenPlusRedBothOverBlue algorithm*

---

**Description**

Applies the TurbFrohn09GreenPlusRedBothOverBlue algorithm

**Usage**

TurbFrohn09GreenPlusRedBothOverBlue(w558, w658, w458)

**Arguments**

w558	numeric. Value at wavelength of 558 nm
w658	numeric. Value at wavelength of 658 nm
w458	numeric. Value at wavelength of 458 nm

**Value**

RasterLayer or numeric

**References**

Frohn, R. C., & Autrey, B. C. (2009). Water quality assessment in the Ohio River using new indices for turbidity and chlorophyll-a with Landsat-7 Imagery. Draft Internal Report, U.S. Environmental Protection Agency.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbHarr92NIR

*TurbHarr92NIR algorithm*


---

**Description**

Applies the TurbHarr92NIR algorithm

**Usage**

TurbHarr92NIR(w857)

**Arguments**

w857                    numeric. Value at wavelength of 857 nm

**Value**

RasterLayer or numeric

**References**

Schiebe F.R., Harrington J.A., Ritchie J.C. Remote-Sensing of Suspended Sediments—the Lake Chicot, Arkansas Project. *Int. J. Remote Sens.* 1992;13:1487–1509.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)



---

TurbLath91RedOverBlue *TurbLath91RedOverBlue algorithm*

---

## Description

Applies the TurbLath91RedOverBlue algorithm

## Usage

TurbLath91RedOverBlue(w658, w458)

## Arguments

w658	numeric. Value at wavelength of 658 nm
w458	numeric. Value at wavelength of 458 nm

## Value

RasterLayer or numeric

## References

Lathrop, R. G., Jr., T. M. Lillesand, and B. S. Yandell, 1991. Testing the utility of simple multi-date Thematic Mapper calibration algorithms for monitoring turbid inland waters. *International Journal of Remote Sensing*

## See Also

Other algorithms: [A110SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

TurbMoore80Red	<i>TurbMoore80Red algorithm</i>
----------------	---------------------------------

---

**Description**

Applies the TurbMoore80Red algorithm

**Usage**

TurbMoore80Red(w658)

**Arguments**

w658                    numeric. Value at wavelength of 658 nm

**Value**

RasterLayer or numeric

**References**

Moore, G.K., Satellite remote sensing of water turbidity, Hydrological Sciences, 1980, 25, 4, 407-422.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [Wy08CI\(\)](#), [Zh10FLH\(\)](#)

---

wq_algorithms	<i>wq_algorithms database</i>
---------------	-------------------------------

---

**Description**

A dataset containing the information about the water quality algorithms

**Usage**

wq\_algorithms

**Format**

A tibble with 91 rows and 4 variables:

- name: algorithm name
- funs: algorithm function
- satellite: satellite/instrument name ("worldview2", "sentinel2", "landsat8", "modis", or "meris")
- bands: list of the bands used from the given satellite/instrument

---

wq_calc	<i>Water quality calculation</i>
---------	----------------------------------

---

**Description**

Calculates a set of water quality indices

**Usage**

```
wq_calc(raster_stack, alg = "all", sat, ...)
```

**Arguments**

raster_stack	RasterStack containing a satellite data
alg	Name (e.g. <code>Am09KBBI()</code> ) or type of the algorithm ("chlorophyll", "phycocyanin", "turbidity") or "all"
sat	Name of the satellite or instrument ("worldview2", "sentinel2", "landsat8", "modis", "meris", or "OLCI")
...	Other arguments passed on to <code>stack()</code>

**Value**

RasterLayer

**Examples**

```
library(raster)

# sentinel2 example
s2 = stack(system.file("raster/S2_Harsha.tif", package = "waterquality"))
s2_A110SABI = wq_calc(s2, alg = "A110SABI", sat = "sentinel2")
s2_two_alg = wq_calc(s2, alg = c("TurbChip09NIROverGreen", "Am092Bsub"), sat = "sentinel2")

## Not run: (
s2_wq = wq_calc(s2, alg = "all", sat = "sentinel2")

# landsat8 example
l8 = stack(system.file("raster/L8_Taylorville.tif", package = "waterquality"))
l8_wq = wq_calc(s2, alg = "all", sat = "landsat8")
)
## End(Not run)
```

---

 Wy08CI

 Wy08CI algorithm
 

---

### Description

Applies the Wy08CI algorithm

### Usage

Wy08CI(w686, w672, w715)

### Arguments

w686	numeric. Value at wavelength of 686 nm
w672	numeric. Value at wavelength of 672 nm
w715	numeric. Value at wavelength of 715 nm

### Value

RasterLayer or numeric

### References

Wynne, T. T., Stumpf, R. P., Tomlinson, M. C., Warner, R. A., Tester, P. A., Dyble, J.; Relating spectral shape to cyanobacterial blooms in the Laurentian Great Lakes. *Int. J. Remote Sens.*, 2008, 29, 3665–3672.

### See Also

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOverTurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Zh10FLH\(\)](#)

Zh10FLH

*Zh10FLH algorithm***Description**

Applies the Zh10FLH algorithm

**Usage**

Zh10FLH(w686, w715, w672)

**Arguments**

w686	numeric. Value at wavelength of 686 nm
w715	numeric. Value at wavelength of 715 nm
w672	numeric. Value at wavelength of 672 nm

**Value**

RasterLayer or numeric

**References**

Zhao, D.Z.; Xing, X.G.; Liu, Y.G.; Yang, J.H.; Wang, L. The relation of chlorophyll-a concentration with the reflectance peak near 700 nm in algae-dominated waters and sensitivity of fluorescence algorithms for detecting algal bloom. *Int. J. Remote Sens.* 2010, 31, 39-48.

**See Also**

Other algorithms: [Al10SABI\(\)](#), [Am092Bsub\(\)](#), [Am09KBBI\(\)](#), [Be162B643sub629\(\)](#), [Be162B700sub601\(\)](#), [Be162BsubPhy\(\)](#), [Be16FLHBlueRedNIR\(\)](#), [Be16FLHGreenRedNIR\(\)](#), [Be16FLHVioletRedNIR\(\)](#), [Be16FLHblue\(\)](#), [Be16FLHviolet\(\)](#), [Be16MPI\(\)](#), [Be16NDPhyI644over615\(\)](#), [Be16NDPhyI644over629\(\)](#), [Be16NDPhyI\(\)](#), [Be16NDTIblue\(\)](#), [Be16NDTIviolet\(\)](#), [Be16Phy2BDA644over629\(\)](#), [Da052BDA\(\)](#), [De933BDA\(\)](#), [Gi033BDA\(\)](#), [Go04MCI\(\)](#), [HU103BDA\(\)](#), [Kn07KIVU\(\)](#), [Ku15PhyCI\(\)](#), [Ku15SLH\(\)](#), [MI092BDA\(\)](#), [MM092BDA\(\)](#), [MM12NDCIalt\(\)](#), [MM12NDCI\(\)](#), [MM143BDAopt\(\)](#), [SI052BDA\(\)](#), [SM122BDA\(\)](#), [SY002BDA\(\)](#), [TurbBe16GreenPlusRedBothOver](#), [TurbBe16RedOverViolet\(\)](#), [TurbBow06RedOverGreen\(\)](#), [TurbChip09NIROverGreen\(\)](#), [TurbDox02NIRoverRed\(\)](#), [TurbFrohn09GreenPlusRedBothOverBlue\(\)](#), [TurbHarr92NIR\(\)](#), [TurbLath91RedOverBlue\(\)](#), [TurbMoore80Red\(\)](#), [Wy08CI\(\)](#)

# Index

## \* Map\_WQ models

Map\_WQ\_basemap, 33  
Map\_WQ\_raster, 34

## \* algorithms

Al10SABI, 3  
Am092Bsub, 4  
Am09KBBI, 5  
Be162B643sub629, 6  
Be162B700sub601, 7  
Be162BsubPhy, 8  
Be16FLHblue, 9  
Be16FLHBlueRedNIR, 10  
Be16FLHGreenRedNIR, 11  
Be16FLHviolet, 12  
Be16FLHVioletRedNIR, 13  
Be16MPI, 14  
Be16NDPhyI, 15  
Be16NDPhyI644over615, 16  
Be16NDPhyI644over629, 17  
Be16NDTIblue, 18  
Be16NDTIviolet, 19  
Be16Phy2BDA644over629, 20  
Da052BDA, 21  
De933BDA, 22  
Gi033BDA, 27  
Go04MCI, 28  
HU103BDA, 29  
Kn07KIVU, 30  
Ku15PhyCI, 31  
Ku15SLH, 32  
MI092BDA, 35  
MM092BDA, 36  
MM12NDCI, 37  
MM12NDCIalt, 38  
MM143BDAopt, 39  
SI052BDA, 40  
SM122BDA, 41  
SY002BDA, 42  
TurbBe16GreenPlusRedBothOverViolet,

43

TurbBe16RedOverViolet, 44  
TurbBow06RedOverGreen, 45  
TurbChip09NIROverGreen, 45  
TurbDox02NIRoverRed, 46  
TurbFrohn09GreenPlusRedBothOverBlue,  
47  
TurbHarr92NIR, 48  
TurbLath91RedOverBlue, 49  
TurbMoore80Red, 50  
Wy08CI, 52  
Zh10FLH, 53

## \* datasets

wq\_algorithms, 50

## \* extract\_lm

extract\_lm, 23  
extract\_lm\_cv, 23  
extract\_lm\_cv\_all, 25  
extract\_lm\_cv\_multi, 26

Al10SABI, 3, 4–22, 28–32, 35–50, 52, 53  
Am092Bsub, 3, 4, 5–22, 28–32, 35–50, 52, 53  
Am09KBBI, 3, 4, 5, 6–22, 28–32, 35–50, 52, 53  
Am09KBBI(), 51

Be162B643sub629, 3–5, 6, 7–22, 28–32,  
35–50, 52, 53  
Be162B700sub601, 3–6, 7, 8–22, 28–32,  
35–50, 52, 53  
Be162BsubPhy, 3–7, 8, 9–22, 28–32, 35–50,  
52, 53  
Be16FLHblue, 3–8, 9, 10–22, 28–32, 35–50,  
52, 53  
Be16FLHBlueRedNIR, 3–9, 10, 11–22, 28–32,  
35–50, 52, 53  
Be16FLHGreenRedNIR, 3–10, 11, 12–22,  
28–32, 35–50, 52, 53  
Be16FLHviolet, 3–11, 12, 13–22, 28–32,  
35–50, 52, 53

- Be16FLHVioletRedNIR, 3–12, 13, 14–22, 28–32, 35–50, 52, 53  
 Be16MPI, 3–13, 14, 15–22, 28–32, 35–50, 52, 53  
 Be16NDPhyI, 3–14, 15, 16–22, 28–32, 35–50, 52, 53  
 Be16NDPhyI644over615, 3–15, 16, 17–22, 28–32, 35–50, 52, 53  
 Be16NDPhyI644over629, 3–16, 17, 18–22, 28–32, 35–50, 52, 53  
 Be16NDTibblue, 3–17, 18, 19–22, 28–32, 35–50, 52, 53  
 Be16NDTiviolet, 3–18, 19, 20–22, 28–32, 35–50, 52, 53  
 Be16Phy2BDA644over629, 3–19, 20, 21, 22, 28–32, 35–50, 52, 53  
  
 Da052BDA, 3–20, 21, 22, 28–32, 35–50, 52, 53  
 De933BDA, 3–21, 22, 28–32, 35–50, 52, 53  
  
 extract\_lm, 23, 24, 26, 27  
 extract\_lm\_cv, 23, 23, 26, 27  
 extract\_lm\_cv\_all, 23, 24, 25, 27  
 extract\_lm\_cv\_multi, 23, 24, 26, 26  
  
 Gi033BDA, 3–22, 27, 28–32, 35–50, 52, 53  
 Go04MCI, 3–22, 28, 28, 29–32, 35–50, 52, 53  
  
 HU103BDA, 3–22, 28, 29, 30–32, 35–50, 52, 53  
  
 Kn07KIVU, 3–22, 28, 29, 30, 31, 32, 35–50, 52, 53  
  
 Ku15PhyCI, 3–22, 28–30, 31, 32, 35–50, 52, 53  
 Ku15SLH, 3–22, 28–31, 32, 35–50, 52, 53  
  
 Map\_WQ\_basemap, 33, 34  
 Map\_WQ\_raster, 33, 34  
 MI092BDA, 3–22, 28–32, 35, 36–50, 52, 53  
 MM092BDA, 3–22, 28–32, 35, 36, 37–50, 52, 53  
 MM12NDCI, 3–22, 28–32, 35, 36, 37, 38–50, 52, 53  
 MM12NDCIalt, 3–22, 28–32, 35–37, 38, 39–50, 52, 53  
 MM143BDAopt, 3–22, 28–32, 35–38, 39, 40–50, 52, 53  
  
 SI052BDA, 3–22, 28–32, 35–39, 40, 41–50, 52, 53  
 SM122BDA, 3–22, 28–32, 35–40, 41, 42–50, 52, 53  
  
 stack(), 51  
 SY002BDA, 3–22, 28–32, 35–41, 42, 43–50, 52, 53  
  
 TurbBe16GreenPlusRedBothOverViolet, 3–22, 28–32, 35–42, 43, 44–50, 52, 53  
 TurbBe16RedOverViolet, 3–22, 28–32, 35–43, 44, 45–50, 52, 53  
 TurbBow06RedOverGreen, 3–22, 28–32, 35–44, 45, 46–50, 52, 53  
 TurbChip09NIROverGreen, 3–22, 28–32, 35–45, 45, 47–50, 52, 53  
 TurbDox02NIRoverRed, 3–22, 28–32, 35–46, 46, 48–50, 52, 53  
 TurbFrohn09GreenPlusRedBothOverBlue, 3–22, 28–32, 35–47, 47, 48–50, 52, 53  
 TurbHarr92NIR, 3–22, 28–32, 35–48, 48, 49, 50, 52, 53  
 TurbLath91RedOverBlue, 3–22, 28–32, 35–48, 49, 50, 52, 53  
 TurbMoore80Red, 3–22, 28–32, 35–49, 50, 52, 53  
  
 wq\_algorithms, 50  
 wq\_calc, 51  
 Wy08CI, 3–22, 28–32, 35–50, 52, 53  
  
 Zh10FLH, 3–22, 28–32, 35–50, 52, 53